

TORTULA PAGORUM IN AUSTRALIA

by

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The moss, *Tortula pagorum* (Milde) De Not., is widely spread in the northern hemisphere and, though sporophytes are quite unknown, it is readily identifiable by the gemmae which resemble very small leaves, fusiform in shape, and also by the prominent semicircular papillae on both surfaces of the upper cells of the leaves. In 1952 and 1953 it was found in two localities in South Australia and also in Western Australia (Willis, 1954). These appear to be the first records from the southern hemisphere though, as will be seen, there were collections of this species made much earlier, but ascribed to *Tortula baileyi* Broth.

Recently, the type of *T. baileyi*, collected by F. M. Bailey, and eight other specimens from New South Wales and Lord Howe Island, collected by W. W. Watts and identified by Brotherus as *T. baileyi*, have been examined. It had been thought possible that *T. baileyi* might be synonymous with *T. pagorum* and that the latter species was fertile in the southern hemisphere, just as is *T. papillosa*. However, it is quite clear that *T. baileyi* is a distinct species, readily separable by several vegetative characters. The leaf is different in shape, being obovate lingulate, and relatively more widened above. *T. baileyi* also has fewer cells in the lamina between the nerve and the margin, especially in the upper part where *T. baileyi* has only about three-quarters as many cells across the leaf as occur in *T. pagorum*. The cells in the upper part of the leaf are larger, being 17–20 μ in *T. baileyi* compared with about 12 μ in *T. pagorum*, and the upper surface of the cells is smooth. The cells on the under surface of the nerve have elevated papillae, in the form of hollow cones or rounded frusta, similar to those of *T. papillosa*, whereas the cells on the under surface of the nerve of *T. pagorum* are smooth. The under surfaces of the cells of the upper part of the lamina of *T. baileyi*, especially near to the nerve, also bear conical papillae, usually one to a cell. Towards the edge of the leaf, the papillae become progressively lower. The upper and lower surfaces of the upper cells of *T. pagorum* bear three or four semicircular papillae and these papillae are present also on the cells on the upper surface of the nerve. The leaf-like gemmae are scarce in *T. baileyi* compared with the situation usual in *T. pagorum*, but this difference is probably of no significance, since the abundance varies in *T. pagorum*.

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Barkman (1963) treats *T. pagorum* as a variety of *T. laevipila* (Brid.) Schwaegr., but gives it the later name of var. *propagulifera* Lindb. He also shows that there are other varieties (of *T. laevipila*) with leafy gemmae, differing in the presence or absence of differentiated marginal cells of the leaf and in features of the gemmae. In those gemmiferous varieties with unbordered leaves, as all Australian specimens are, the apical cells of the gemmae are truncate and papillose in var. *pagorum* (Milde) Husnot (= var. *propagulifera* Lindb.), but acute and smooth in var. *wachterii* Barkm. The gemmae of Australian specimens usually have a conical terminal cell, acute and with a small apical papilla. However, on some gemmae the apical cell is bent to one side and on a few it is truncate, bearing two papillae. It seems best to treat the Australian plants as the species *T. pagorum*.

All of the specimens gathered by Watts in New South Wales and Lord Howe Island are definitely *T. pagorum*. All have the relatively small, rather obscure cells and the three or four prominent semi-circular papillae on both surfaces of each cell. None of them have sporophytes. The range of *T. pagorum* in the southern hemisphere is therefore wider than originally suspected. The habitat is usually on trees, but the specimens from Lord Howe Island grew on rocks. A note by Watts in the packet of his number 269 states "Characteristic brood-bodies found, after long search, on enclosed. The hair-point is very long, sometimes as long as the leaf. Grows on rocks. In N.S.W. *T. baileyi* sometimes grows in rock-crevices, but mostly on trees. W.W.W.". The gemmae are, in fact, quite scarce on this specimen and, indeed, the abundance does vary amongst the Australian specimens of *T. pagorum*. Sometimes the gemmae are extremely abundant, forming a dense cluster at the end of a branch. In other cases, smaller bunches are present in the axils of leaves near the apex of the stem. In a few specimens, they are very scarce. This may represent a seasonal variation, with a minimum from July to September, but the specimens are too few to support any reliable conclusions.

The presence of *T. pagorum* in Australia is not incompatible with it being an adventive species, rather than a native. The abundant gemmae must provide an efficient means of dispersal and it is difficult to conclude that any of the localities are beyond the chance of introduction. It will be interesting to discover whether this moss tends to become more widely spread in the future, just as various introduced species have increased significantly of recent years in Britain and elsewhere. Also, *T. baileyi* should be sought, since no specimen, apart from the type, appears to have been seen. Descriptions of these two species follow, together with the known occurrences:

Tortula baileyi Broth. Öfv. Finska Vet. Soc. Förh. 33: 97 (1890).

Dioicous, in dense, small, soft tufts on trees, olive green in colour; stems up to 4 mm. high, densely leafy, with numerous gemmae at apex; leaves incurved and closely appressed when dry, erect-spreading when moist, carinate concave, panduriform, round at apex, with a long hair; *leaf* about 2 mm. long, 0.7 to 0.9 mm. wide at base, widening above to 0.9 to 1.1 mm., pellucid; back of nerve and lamina with elevated conical papillae, usually one per cell; *margin* plane throughout, entire, not bordered; *nerve* yellow-brown, 65 μ wide at base, produced into a long, smooth, hyaline hair; *basal cells* shortly rectangular, chlorophyllose, longer and empty towards the nerve, *upper cells* strongly chlorophyllose, roundish, 17–20 μ diameter, the walls thickened at the angles; cells smooth above. *Perichaetial bracts* congested in a somewhat exserted cylinder, sheathing, hyaline, delicate, shortly pointed or mucous, obtuse, nerve slender; *seta* short, to 8 mm. high, erect, 0.3 mm. thick at base, pale red brown, apex paler, smooth, strongly twisted to the right when dry; *theca* 3.5 mm. long, oblong-cylindrical, erect or slightly curved, not shiny, thick walled, brown, mouth not constricted; *annulus* double, persistent; *peristome* simple 1.15 mm. long, lower third tubular, tube whitish, papillose, teeth pale purple, twice twisted, papillose; *operculum* narrowly conical, about 1.7 mm. long, pale, erect or somewhat curved, acute; *calyptra* cucullate, entire at base, pale, apex brown, smooth, half covering the theca. *Male plant* unknown. *Gemmae* linear-lanceolate, apex hyaline, cuspidate, cells in four rows, strongly papillose, chlorophyllous, produced at apex of stem and in axils of upper leaves.

South Australia: Adelaide, stem of tree, F. M. Bailey 472, 1888 (TYPE).

Tortula pagorum (Milde) De Not. Epil. Briol. Ital. 542 (1869).

Dioicous, densely tufted in small to extensive mats or cushions, usually on trees, but rarely on rocks, clear green, becoming darker when dry, often with a reddish tinge; stems densely leafy, up to 10 mm. high, but usually less than 5 mm., radiculose at base; leaves incurved and closely appressed when dry, not crisped, but often slightly twisted, erect-spreading when moist, oblong obovate, lingulate or panduriform, concave above, 2.0 to 2.5 mm. long (including the hair), about 1 mm. wide, rounded, truncate or rarely retuse at apex; *margin* plane, not bordered, rarely slightly inflexed, strongly papillose-crenate; *nerve* pale red, thick, smooth on the back, excurrent as smooth or rarely somewhat roughened, hyaline or coloured hair, up to 1 mm. long, very conspicuous in dry plants; cells on back of nerve smooth; *nerve in cross section* showing two median guide cells, two ventral cells of nearly equal size, and a larger dorsal stereid group; *basal cells* hyaline, with yellow walls, the cross walls often thickened, rectangular towards the nerve, shorter towards the

margins; cells of upper three-quarters of leaf much more densely chlorophyllose, roundish-quadrate to hexagonal, isodiametric, about $12\ \mu$ in diameter, papillose with numerous high, crescent-shaped or sometimes circular papillae, about four to each cell. *Sporophyte* unknown. *Gemmae* lanceolate to elliptic and ovate, densely papillose or verrucose, leaf-like, $200\text{--}250\ \mu \times 80\text{--}100\ \mu$, with a smooth or faintly papillose hyaline apical spine bearing a terminal papilla, but sometimes truncate and bearing two papillae, produced at apex of stem and in axils of the upper leaves.

Collections known from Australia

SOUTH AUSTRALIA: on tree, Granite Island, Victor Harbour *D. G. Catcheside* 52.305, 8 Nov. 1952; Melrose, on base of red gum by Willochra Creek, *D. G. Catcheside* 53.162, 22 Aug. 1953; Parawirra, on tree, *D. R. Mitchell*, May 1965; North Terrace, Adelaide, on shaded elm trunks outside University, *J. H. Willis*, 4 Aug. 1966; Stuart Highway 24 m. N.W. of Port Augusta, on trunk of *Acacia sowdenii*, *J. H. Willis*, 3 Aug. 1966.

WESTERN AUSTRALIA: South end of Wongan Hills, about 100 miles N.E. of Perth, *Rica Erickson*, June 1953 (*Willis*, 1954).

NEW SOUTH WALES: on tree, Reserve, East Maitland, *W. W. Watts* 4644, 6 Dec. 1900; on fig tree, Reserve, East Maitland, *W. W. Watts* 4645, 6 Dec. 1900; prostrate tree, Errowal, nr. Nowra, *W. W. Watts* 6250, 21 May, 1903; tree, The Island, Mayfield, nr. Nowra, *W. W. Watts*, 23 May 1903; tree off Grenfell Road, 7 m. from Young, *W. W. Watts* 6939, 17 Aug. 1903; on tree, Tubbul-road, 15 m. from Young, *W. W. Watts* 6964, Sept. 1903.

VICTORIA: on trunks of bull mallee and moonah, Djerriwarrh Creek at Western Highway bridge, *D. J. Carr*, Oct. 1955; on butt of old red gum, near Shrine of Remembrance, Melbourne, *J. H. Willis*, 2 Sept. 1960; 20 m. west of Mildura, on base of eucalypt, *D. G. Catcheside* 64.106, 22 Dec. 1964.

LORD HOWE ISLAND: on rocks, Northern Hills, *W. W. Watts* 249 (b) and 269, July 1911.

References

- Barkman, J. J., 1963. A contribution to the taxonomy of the *Tortula laevigata*-*T. pagorum* complex. *Rev. Bryol. Lich.* 32: 183-192.
Brotherus, V. F., 1890. *Tortula baileyi* Broth. *Öfv. Finska Vet. Soc. Förh* 33: 97.
Willis, J. H., 1954. Mosses new to Western Australia. *Victorian Naturalist* 71: 8-12.

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